

Module

V

Equipment Control

OBJECTIVES

1. Understand the requirements of DOE 5480.19 regarding equipment control at DOE facilities and associated impact on safety and efficiency of operations. (1.b)
2. Refer to a copy of DOE 5480.19, Attachment I and locate applicable guidelines and requirements for specific activities. (1.a)
3. Describe the key elements of a lockout and tagout system. (1.o)

DOE 5480.19, Attachment I, Chapters 8, 9, 10, and 18 have been combined to make up the Equipment Control section.

I. Chapter Summaries

A. Chapter 8: Control of Equipment and System Status

This chapter provides an overall perspective on control of equipment and system status. Control of equipment and system status contributes to safe and efficient facility operations by ensuring that an adequate “safety envelope” exists to authorize and perform work. A facility’s safety envelope is defined by the proper operation and configuration of a set of equipment considered vital to a safe operating environment. This equipment is termed “vital safety equipment.” If a piece of equipment fails or is shut down for maintenance, this fact needs to be recorded so that affected operations can be terminated or prevented until the equipment or system is restored. In the case where redundant equipment exists that could be operated to maintain the safety envelope for continued operations, its status must be known in order for it to be relied upon. Temporary modifications must also be tracked for the same reasons.

B. Chapter 9: Lockouts and Tagouts

This chapter describes the important elements of a Lockout/Tagout Program and is intended to meet the requirements of 29 CFR 1910. A safe and efficient operational environment is maintained by providing a method for equipment status control through component tagging or locking which should protect personnel from injury, protect equipment from damage, maintain operability of plant systems, and maintain the integrity of the physical boundaries of plant systems. Appropriate and proper use of tags and locks prevents inadvertent operation of equipment when there is a potential for equipment damage or personnel injury during equipment operation, servicing, maintenance, or modification activities.

C. Chapter 10: Independent Verification

This chapter describes the important aspects of an independent verification program which when implemented should provide a high degree of reliability in ensuring the correct facility operation and the correct position of components such as valves, switches, and circuit breakers. This is important to the safe and efficient operation of a facility because independent verification recognizes the human element of component operation; that is, any operator, no matter how proficient, can make a mistake. Thus when mistakes are found and corrected before an operation takes place, safety and efficiency are improved.

D. Chapter 18: Equipment and Piping Labeling

This chapter describes the important aspects of a labeling program. A well-established and maintained equipment labeling program should help ensure that facility personnel are able to positively identify equipment they operate. It will enhance training effectiveness, help reduce operator and maintenance errors resulting from incorrect identification of equipment, and reduce personnel radiation and other hazardous material exposure as operators spend less time identifying components.

II. Chapters and Guidelines Review

- A. **Control of Equipment and System Status:** Establishes formal guidance to ensure that the configuration of all equipment is maintained and that the operators know the status of equipment at all times. This ensures that personnel, equipment, and environmental safety is maintained through proper component, system, and equipment configuration management.

(The following explanations provide a summary for each of the guidelines. Refer to Attachment 1 of DOE 5480.19 if more detail is needed for a specific guideline.)

1. **Status Change Authorization and Reporting:** Operations supervisors are responsible for maintaining a broad overview of operations and proper configuration, authorizing status changes to major equipment and systems, and communicating status changes to operators.
2. **Equipment and System Alignment:** Equipment and systems are aligned or checked for proper alignment prior to operations. Alignments are performed using checklists and records of alignments and any related deviations are maintained.
3. **Equipment Locking and Tagging:** Locks and tags are used on components requiring special administrative control for safety or other reasons. Locks and tags provide some security that a component will be operated only by authorized facility personnel during required evolutions in a controlled fashion.
4. **Operational Limits Compliance:** Limiting conditions for operations should be established and operating personnel should be apprised of the conditions and actions for which they may be responsible. Operations supervisors ensure that actions taken to comply with operational limits are

appropriate and correct or that they mitigate adverse consequences.

5. **Equipment Deficiency Identification and Documentation:** Equipment deficiencies are noted by facility operating personnel and identified in the work control system for correction. Methods that identify deficient equipment to operating personnel (such as deficiency tags, logs, status sheets, or caution tags) should be established.
6. **Work Authorization and Documentation:** The operations supervisor or designee should authorize all shift activities (including maintenance) on equipment that is important to safety, affects operations, or changes control indications or alarms. This authorization should be in writing on the document controlling the work, and should be available in the control area for review by operating personnel.
7. **Equipment Post-Maintenance Testing and Return to Service:** The operations supervisor should ensure that equipment is tested following maintenance to demonstrate that it is capable of performing its intended function. Testing should include performance of all functions that may have been affected by the maintenance.
8. **Alarm Status:** The status of control panel and/or local panel alarms are readily available to appropriate operating personnel, including: alarms that are totally disabled, alarms with individual inputs disabled, alarms with temporarily changed setpoints, alarms that are normally lighted during power operation, and multiple input alarms that do not reflash when more than one input is activated.
9. **Temporary Modification Control:** Administrative control systems are established for installation of

temporary modifications such as electrical jumpers, lifted leads, pulled circuit boards, disabled annunciators/alarms, mechanical jumpers/bypasses, etc.

10. **Distribution and Control of Equipment and System Documents:** A system is established to ensure that operations personnel receive and use the latest revisions of engineering drawings and specifications.

- B. **Lockout and Tagout (LO/TO):** Establishes a method of equipment control through locking and tagging to protect personnel from injury, protect equipment from damage, maintain operability, and maintain physical boundaries.

(The following explanations provide a summary for each of the guidelines. Refer to Attachment 1 of DOE 5480.19 if more detail is needed for a specific guideline.)

1. **Lockout/Tagout Use:** Locks and Tags should be placed on controls when necessary for safety or other special administrative reasons. Lockout is the application of a lock (built-in or external) on a control to render the control inoperative. Tagout is the application of a danger or warning device on or as close as possible to the control device, to indicate that the control is not to be used except under conditions specified by the tag.
2. **Lockout and Tagout Implementation:** Lockout is the preferred method of isolation. If lockout is not possible, the isolating device should be tagged out. Administrative controls include: Approved lists of components requiring lockout; criteria for locking additional components; restricted access to keys for locks; techniques for locked component position verification; lockout deviation authorization and documentation; and periodic checks of locked components.

3. **Protective Materials and Hardware:** Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, etc., should be provided for isolating equipment from energy sources. LO/TO devices are singularly identified and are durable, standardized, substantial, identifiable, and provide warnings.
4. **Lockout/Tagout Program:** A program is established which consists of procedures to control potentially hazardous energy and materials and personnel training.
5. **Procedures for Lockout/Tagout:** Procedures clearly and specifically state the scope, purpose, authorization, rules, and techniques of the LO/TO program.
6. **Application of Lockout/Tagout:** LO/TO procedures cover the following sequence of actions: Preparations for shutdown; equipment shutdown; equipment isolation; affixing LO/TO; relieving stored energy; verifying isolation and de-energization; securing LO/TO; and post-use removal, checking, and/or positioning of the LO/TO equipment and associated boundaries.
7. **Testing or Positioning of Equipment or Components:** Temporary removal of LO/TO devices is discouraged, but if the situation permits it can be accomplished as follows: clear equipment of tools and materials; clear personnel from equipment area; remove the LO/TO device per procedure; energize the equipment and perform test or positioning; and, de-energize all systems and reapply LO/TO.

8. **Periodic Inspections:** Periodic inspections should be conducted by authorized personnel to determine whether or not procedures are being followed, and to correct any observed deficiencies.
9. **Caution Tags:** The administration of caution tags can be accomplished through the LO/TO program or separately. The use of caution tags should be restricted to those situations in which a component or system is functional, but a precaution or item of information is needed prior to operation. Caution tags should not be used for protection of personnel; this situation warrants use of a LO/TO device or tag.
10. **Training and Communication:** Training is provided and documented to ensure that personnel understand the purpose, function, and limitations of the LO/TO program, and understand hazards and techniques, such that they can safely apply, use, and remove lockouts and tagouts.
11. **Lockout or Tagout Implementation:** Accomplished by authorized, qualified personnel.
12. **Notification of Personnel:** Supervisors notify affected personnel before the application and after removal of LO/TO devices.
13. **Outside Contractors:** Facilities and outside contractors inform each other of their respective LO/TO procedures and ensure that their personnel are aware of any changes.
14. **Group Lockouts or Tagouts:** Groups performing maintenance or service use a procedure that will provide for equivalent safety provided by the personal LO/TO device.

15. **Shift or Personnel Changes:** Specific procedures are used during shift or personnel changes to ensure continuity of LO/TO protection, including orderly transfer of LO/TO devices between personnel or shifts.

- C. **Independent Verification:** Establishes a method to ensure that facility components are positioned correctly, so that every facility system operates as required.

(The following explanations provide a summary for each of the guidelines. Refer to Attachment 1 of DOE 5480.19 if more detail is needed for a specific guideline.)

1. **Components Requiring Independent Verification:** Components critical to ensuring safe and reliable operation are identified in facility procedures or other official documents, and receive an independent verification of their position when warranted. These components include:
 - Systems and Components with safety related functions - except when mispositioning would not affect system performance, would be immediately known to the operator, or would cause significant radiation exposure
 - Non-safety related components - which if mispositioned, could cause unplanned shutdowns, challenges to safety systems, or radioactive/toxic material release.
2. **Occasions Requiring Independent Verification:** Components receive independent verification when associated equipment must be available and the chance that the component was mispositioned exists. Situations include: return of equipment to service after maintenance or test; removal of equipment from service; system lineups; and periodic checks during operation.

3. **Verification Techniques:** Facility instructions, which describe approved methods for verifying positions of components, exist, and operators are trained on these methods. The following guidelines apply to verification techniques:
- Independence - interaction between component operators/positioners and verifiers is minimized.
 - Remote Position Indicators - since remote indications can fail, local verification is performed unless precluded by ALARA or other factors.
 - Process Parameters - parameters can be misleading indicators of component position, and should not normally be used as the only means of verification. Procedures should specify when and where process parameters may be used.
 - Throttled Valves - position indicators, scribe marks, etc., are used to verify valve position, rather than cycling the valve which could cause mispositioning.
 - Surveillance Testing - surveillance tests frequently will not serve to verify the position of all components that are important to subsequent system operation. Consequently, they should not be used unless approved beforehand by the operations supervisor.
 - Operations Self-Appraisal and Verification - Independent programmatic operations appraisals are performed to ensure environmental, safety, and health considerations are in accordance with established criteria.
- D. **Equipment and Pipe Labeling:** Ensures positive identification of facility components.

(The following explanations provide a summary for each of the guidelines. Refer to Attachment 1 of DOE 5480.19 if more detail is needed for a specific guideline.)

1. **Components Requiring Labeling:** Valves; major equipment; switches; circuit breakers; instruments and gages; emergency equipment; room doors; etc.
2. **Label Information:** Information is consistent with that found in facility procedures, valve lineup sheets, and diagrams, and incorporates standard nomenclature which is understood by personnel.
3. **Label Placement:** Labels are placed on or as near as practicable to the equipment, and are oriented so that they are easy to read and enable correct identification of components.
4. **Replacing Labels:** Procedures are established to ensure that misplaced or damaged labels are replaced and that labeling deficiencies are promptly identified and corrected.

References and Suggested Reading

DOE 5480.19

Chapter 8	Control of Equipment and System Status
Chapter 9	Lockouts and Tagouts
Chapter 10	Independent Verification
Chapter 18	Equipment and Piping Labeling

DOE-STD-1039-93 Guide to Good Practice for Control of Equipment and System Status

DOE-STD-1030-92 Guide to Good Practices for Lockouts and Tagouts

DOE-STD-1036-93 Guide to Good Practices for Independent Verification

DOE-STD-1044-93 Guide to Good Practices for Equipment and Piping Labeling

DOE-EM-STD-5505-96 Operations Assessments

**Module V
Exercise**

Requirements Exercise

Answer the following questions using DOE 5480.19:

Please see the end of this module for solutions/explanations.

1. An equipment temperature alarm is disabled. Describe the required actions to ensure proper monitoring and plant safety.

2. What is the purpose of a system alignment?

3. Describe the administrative controls required if a temporary system is to be installed.

4. Briefly describe the terms "lockout" and "tagout".

5. What guidance is provided for "Group Lockouts or Tagouts"?

6. What types of administrative measures should be established that would define controls over "locked components"?

7. What actions are necessary, if any, if the person who applied a LO/TO device is not available to remove it?

Conduct of Operations

8. Can any available lock or tag be used to lockout an energy isolation device? Explain.
9. Who is responsible for reviewing the record of all active caution tags? What does this review consist of?
10. Is it allowable to temporarily remove a LO/TO device?
11. When should a person receive training on the LO/TO program? Are there any re-training requirements?
12. Are there any requirements concerning the orderly transfer of Lockout or Tagout devices between personnel or shifts?
13. What is independent verification and why is it important?
14. Describe three situations where independent verification would be appropriate.
15. What are some of the methods to ensure that misplaced or damaged labels are replaced?

Requirements Exercise Solutions

1. An equipment temperature alarm is disabled. Describe the required actions to ensure proper monitoring and plant safety.

(pg I-50, Ch. 8, guideline 8)

- **Take appropriate action to monitor equipment parameters for abnormal conditions.**
- **Log the deficiency into operations logs and equipment deficiency log or equivalent.**
- **Place a tag or sticker on the disabled alarm informing operators of the status.**
- **Take action to have the alarm repaired.**

2. What is the purpose of a system alignment?

(pg. I-48, Ch. 8, guideline 2)

System alignments are used to ensure individual components are first aligned or checked prior to placing a system or equipment into operation. By conducting a proper alignment, one ensures that systems or equipment are ready to be placed into proper and safe operation.

3. Describe the administrative controls required if a temporary system is to be installed.

(pg. I-51, Ch. 8, guideline 9)

The administrative control system should provide for communicating the installation of temporary modifications to the design authority to allow for technical oversight and an evaluation of the impact on current design activities, and approval of the design modification. The control systems should make provisions for safety reviews, installation, approval, independent verification of correct installation and removal, documentation of the modification, update of operating procedures and documents, training, marking of installed modifications, and periodic audits of outstanding modifications.

4. Briefly describe the terms "lockout" and "tagout".

(pg. I-53, Ch. 9, guideline 1)

Lockout is the application of a lock on a control a to render the control inoperative. Tagout is the application of a danger or warning device on the control, which indicates that the control is not to be used except under conditions indicated by the tag.

5. What guidance is provided for "Group Lockouts or Tagouts"?

(pg. I-63, Ch. 9, guideline 14)

When servicing or maintenance is being done by multiple groups on the same system, they should use a procedure that provides for equivalent safety as the "personal" LO/TO device. For an example refer to section 4.5.3 in the "Guide to Good Practices for LO/TO's."

6. What types of administrative measures should be established that would define controls over "locked components"?

Refer to pg. I-54, guideline 2, part d, (1) thru (6).

7. What actions are necessary, if any, if the person who applied a LO/TO device is not available to remove it?

(pg. I-59, Ch. 9, guideline 6, part g(3))

Each LO/TO device should be removed by the person who applied the device. When that person is unavailable, the device may be removed under the direction of the appropriate supervisor/manager, provided that specific procedures and training have been developed and incorporated into the facility LO/TO program.

8. Can any available lock or tag be used to lockout an energy isolation device? Explain.

Refer to pg. I-55, Ch. 9, guideline 3, parts a and b.

9. Who is responsible for reviewing the record of all active caution tags? What does this review consist of?

(pg. I-60, Ch. 9, guideline 9, part c)

The recorded and associated tags should be reviewed by qualified personnel. The review should verify the continued need and applicability for each caution tag and ensure that all active tags match the index. The review should be documented. The operations supervisor/manager should determine what action is needed to resolve the continued use of caution tags being used for extended periods (e.g., three months).

10. Is it allowable to temporarily remove a LO/TO device?

(pg. I-60, Ch. 9, guideline 7)

Temporary removal of LO/TO devices should be discouraged. If it's necessary to temporarily remove them, then the following sequence should be followed:

- . clear the equipment of tools and materials.***
- . clear personnel from the area.***
- . remove LO/TO device per the procedure.***
- . energize and proceed with testing, positioning, etc.***
- . de-energize all systems and reapply the LO/TO device.***

11. When should a person receive training on the LO/TO program? Are there any re-training requirements?

(pg. I-61 & 62, Ch. 9, guideline 10)

The guideline does not specifically say when a person should receive LO/TO training. It does state that the training is to be documented and that ALL personnel should know the purpose and function of the LO/TO program. Refer to the guideline for additional training/re-training requirements.

12. Are there any requirements concerning the orderly transfer of Lockout or Tagout devices between personnel or shifts?

(pg. I-63, Ch. 9, guideline 15)

Yes. All facilities should establish specific procedures for the orderly transfer of responsibility and protection under LO/TO to ensure personnel safety and work boundary isolation during shift or personnel changes.

13. What is independent verification and why is it important?

(pg. I-65, Ch. 10, B (Discussion))

Independent verification is the act of checking that a given operation conforms to established operational criteria, as well as checking a component position independently of activities related to establishing the components position (i.e., it's much more than a "time and distance" second check.) It is important because this concept recognizes the human element of any operation. Any operator, no matter how proficient, can make a mistake.

14. Describe three situations where independent verification would be appropriate.

(pg. I-67, Ch. 10, guideline 2)

- (1) returning equipment to service following maintenance/testing***
- (2) removing equipment from service***
- (3) system lineups***
- (4) periodic checks during facility operations***

15. What are some of the methods to ensure that misplaced or damaged labels are replaced?

(pg. I-99, Ch. 18, guideline 4)

Whatever they are, procedures should be established to ensure that misplaced or damaged labels are replaced. This is important because labeling impacts many areas such as procedure use, radiological control/personnel exposure, training, maintenance, communication, and LO/TO. Refer to guideline 4 for some specific examples.